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Akiko Fujino

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EXAMINER

WANG, EUGENIA

ART UNIT

PAPER NUMBER

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/555,447	Applicant(s) FUJINO ET AL.	
	Examiner EUGENIA WANG	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 19 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6 and 8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6 and 8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on October 19, 2009 has been entered.

Response to Amendment

2. In response to the amendment received October 19, 2009:
- a. Claims 3, 5, and 7 have been cancelled as per Applicant's request. Claims 1-2, 4, 6, and 8 are pending.
 - b. The core of the previous prior art rejection of record has been maintained, with slight changes in the organization of the rejection and the rejection in light of the amendments. Since the previous prior art rejection still applies, and no change has been made to the claim limitations as a whole at the time of Appeal, a *Res Judicata* rejection is applicable. It is noted that another prior art rejection of record has been applied in light of the request for continued examination.

Res Judicata

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3. Claims 1, 2, 4, 6, and 8 are rejected under *res judicata*. *Res Judicata* should be applied when the earlier decision was a decision of the Board of Appeals or any one of the reviewing courts and when there is no opportunity for further court review of the earlier decision. When making a rejection on *res judicata*, action should ordinarily be made also on the basis of prior art, especially in continuing applications. In most situations the same prior art which was relied upon in the earlier decision would again be applicable. Since no change to the scope of the claim limitations as a whole has been made, as all claim limitations (even the amendments made) were presented for Appeal, wherein the Examiner was affirmed, *res judicata* is applicable. As seen below, the core of the original prior art rejection (as presented for appeal) has been maintained. Accordingly, as all of the claim limitations involve the same issues previously up for Appeal, *res judicata* is applicable. See MPEP § 706.03(w).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 2, 4, 6, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6287720 (Yamashita et al.) in view of US 6,576,366 (Fujiwara et al.) and US 2005/0014064 (Shi et al.).

As to claims 1-2, Yamashita et al. teach a nonaqueous secondary battery with a nonaqueous electrolyte with a positive electrode comprising cathode active material, a negative electrode comprising anode active material, and a separator disposed between the positive and negative electrodes, operatively with the electrolyte (col. 5, lines 8-23).

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Furthermore, Yamashita et al. exemplify a lithium ion secondary battery with a cathode active material made of a composite of a lithium oxide (col. 11, lines 7-10). An anode active material inherently has the property of absorbing and desorbing lithium. Example 6 has a separator [13B] made of polyethylene (col. 30, lines 63-66). Additionally, example 6 has a second layer of the separator that acts as a porous film [13A] made of insulating substance (filler) α -Al₂O₃ and binder polyvinylidene fluoride (PVDF), where the porous film [13A] is directly formed on the cathode active material layer [11b] (col. 29, lines 51-58; col. 30, lines 5-8). Furthermore, the weight ratio of α -Al₂O₃ to PVDF is 100/5 (col. 29, lines 63-64). Therefore, the weight percentage is:

$$\frac{wt_alumina}{total_wt} = \frac{100}{100+5} * 100\% = 95.2\%$$

Yamashita et al. does not teach that (a) the separator comprises a non-woven fabric (as required by claim 1), (b) that the non-woven fabric has a melt-down temperature of 150°C or more (as required by claim 1), or (c) the thicknesses of each individual section of the separator: 0.5 μ m to 20 μ m [13A] for the porous film layer and 15 μ m to 50 μ m for the non-woven fabric [13B] and (as required by claims 1 and 2, respectively).

With respect to (a), Fujiwara et al. teaches a non-aqueous electrolyte secondary cell (title). In the teaching, materials of separators are disclosed including olefin polymers, such as polyethylene (as used by Yamashita et al. in example 6), and non-woven cloth (col. 9, lines 27-38). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the non-woven cloth taught by

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Fujiwara et al. for the separator of Yamashita et al.'s battery, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

With respect to (b), Shi et al. teaches a high melt integrity battery separator for lithium ion batteries (title). The separators are made of nonwoven flat sheets, wherein high temperature melt integrity means that the separator will sustain dimensional stability until a temperature of at least 200°C (abstract; para 0011). The motivation for providing nonwoven flat sheet separators with this characteristic is in order to better maintain dimensional stability within a battery. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the materials of Shi et al. (nonwoven flat sheets) in order to improve dimensional stability of the separator at higher temperatures.

With respect to (c), it is first noted that Yamashita et al. teaches a separator [13A, 13B] with a thickness between 100 nm to 100 μm (col. 7, lines 52-55). Specifically, the composite separator thickness of example 6 (relied upon) is 25 μm (col. 31, lines 10-13). Although Yamashita et al. does not mention the thicknesses of each individual section of the separator, 15 μm to 50 μm for the non-woven fabric [13B] (as applied to claim 2) and 0.5 μm to 20 μm [13A] for the porous film layer (as applied to claim 1), the combined range of these two sections yields between 15.5 μm to 70 μm . It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to make Yamashita et al.'s separator with the ranges specified by claims 1 and 2,

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as it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Additionally, claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (*In re Woodruff*, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)).

As to claim 4, the combination teaches the claim limitation, as Shi et al. teaches nonwoven flat sheets, which are fibers that are held together, used for separators; specific fibers are polyamides and polyimides (para 0013). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the nonwoven flat sheets of Shi et al. as the separator for a battery, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

As to claim 6, Yamashita et al. teaches different binders. Examples include PVDF (as used in previously cited example 6) and acrylonitrile-butadiene (copolymer latex) (col. 7, lines 59-65).

As to claim 8, Yamashita et al. teaches that Figs. 7(a) to (c) show with all of the structural attributes of their battery and can additionally be spirally wound to form a spirally wound unit cell (col. 16, lines 41-48).

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5. Claims 1, 2, 4, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5869208 (Miyasaka) in view of US 2001/0004502 (Nakamizo et al.) and Shi.

As to claim 1, Miyasaka teaches of a lithium ion secondary battery (col. 1, lines 3-7). Miyasaka's positive electrode material is a lithium metal oxide (col. 2, lines 37-44, specific examples seen in col. 11, lines 44-52). Furthermore, the negative electrode is capable of receiving (absorbing) and releasing (desorbing) lithium ion/metal (col. 6, lines 54-58). There is a separator [10] which separates the positive electrode [8] and negative electrode [9] (col. 7, lines 54-65; fig.). Miyasaka exemplifies two types of separator material a sheet and a non-woven sheet (fabric) (col. 9, lines 62-67). Furthermore it is noted that there is a protective layer (porous film) formed on the surface of the positive electrode (col. 6, lines 59-64). First it is noted that the protective layer has small openings/voids, showing that it is porous (col. 7, lines 29-31). Specifically, it is taught that the protective layer is formed on the surface of the positive using a binder (the use of a binder constitutes an adherence) (col. 7, lines 18-21, lines 32-36; col. 12, line 58 to col. 13, line 6). The thickness of the protective layer has a preferable, exemplified range of between 2-10 μm (a portion that falls completely within the claimed range (col. 7, lines 40-41). It is specifically noted that the protective layer in the example is specifically 15 μm (col. 13, lines 5-6). Furthermore, the protective layer (porous film) is a mixture of particles of electro-insulative material (filler) with a binder (col. 7, lines 18-21). Alumina is within a list of electro-insulative materials, and is specifically used (in combination with titanium dioxide) in the example (col. 7, lines 1-10; col. 12, lines 58-63). It is taught that the electro-insulative (filler) is most preferably in

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the protective layer is 90-98% by weight (a portion that is completely within the claimed range) (col. 7, lines 26-29). In the specified example of the protective, the filler material is a mixture of alumina and titanium oxide, wherein the only solid portion other than this such material is the use of CMC (0.5 wt %) and PVDF (2 wt %) (col. 12, line 58 to col. 13, line 2). Accordingly such a mixture would yield that the filler (alumina and titanium dioxide) material is in a weight percent of 97.5% (100%-0.5%-2%).

It is noted (a) that although Miyasaka et al. exemplifies a non-woven sheet for a separator, such a material is not specifically used in an example, and (b) that Miyasaka et al. does not specifically mention the melt-down temperature of the separator.

With respect to (a), it is first emphasized Miyasaka's teaching at the very least renders obvious the replacement of a non-woven, as it only exemplifies two types of separators, one of which is non-woven (col. 9, lines 62-67). Accordingly, although the separator used for the example is a polypropylene film (and not an explicit non-woven material) (col. 12, lines 29-31), Miyasaka's teaching at the very least renders obvious the replacement of a non-woven, as it only exemplifies two types of separators, one of which is non-woven. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, since Miyasaka recognizes the use of both a sheet and a non-woven, at the very least, the substitution of the non-woven for the film in the example would have yielded the predictable result of acting as a separator material within the battery system. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was

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made to substitute a film separator for a non-woven separator, as Miyasaka specifically appreciates both types of separators, and wherein the substitution of one known, appreciated type (i.e. non-woven) for another known, appreciated type (i.e. film/sheet) would have yielded the predictable result of operating in the same manner.

Additionally, at this point Nakamizo et al. is also relied upon to give motivation, as to why one of ordinary skill in the art would have found to obvious to replace a polypropylene film with a non-woven of the same material. Nakamizo et al. teach that it is known to use microporous films, such as polypropylene, however, such films do not retain electrolyte well, which leads to an increase in internal resistance (para 0007). However, non-woven fabric separators (of, for example polypropylene) improve electrolyte-retaining nature (para 0008). Accordingly, the motivation to use a non-woven instead of a film electrolyte would be to improve electrolyte retention, which would in turn reduce internal resistance (para 0007-0008). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use a non-woven separator instead of a film separator (both embodied by Miyasaka), as taught by Nakamizo et al. in order to improve electrolyte retention and reduce internal resistance.

With respect to (b), Shi et al. teaches a high melt integrity battery separator for lithium ion batteries (title). It is specifically Shi mentions that a non-woven separator comprising polypropylene is known to have a dimensional stability up to 167°C (para 0007, lines 8-11). Furthermore, Shi specifically notes that higher melt integrity is desired in order to not inhibit ion flow between the cathode and anode and in order to

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maintain dimensional stability (para 0008; para 0011). Therefore, Shi et al. provides motivation for wanting to make the separator have as high of a melt integrity (temperature) as possible (wherein at least 200°C is desired), which includes sustaining dimensional stability and strength and for promoting ion transfer (since ion transfer would be stopped if the melt integrity was too low, thus inhibiting the battery from operating) (para 0008; para 0011). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impart as high of a melt integrity to the separator (167°C, 200°C, and 380°C specifically noted) as possible in order to improve dimensional stability of the separator at higher temperatures and in order to keep the ions flowing (to facilitate battery operation).

As to claim 2, Miyasaka embodies the thickness of the separator (embodied to be a sheet or a non-woven sheet). The thickness is most preferably in a range of 5-30 μm (col. 9, lines 62-65; col. 10, lines 1-3). It is noted that most of this specifically appreciated range is coincident with the claimed range (of 15-50 μm). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

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As to claim 4, Miyasaka embodies three specific separator materials, one of which is polypropylene (col. 9, lines 62-66). It is noted that polypropylene material is specifically embodied within the example (col. 12, lines 29-31). Accordingly, Miyasaka at the very least render obvious the use of polypropylene as the material for the separator. (It is reiterated that as set forth in claim 1, part (a), it would have been obvious to substitute the type of separator – i.e. non-woven for the film – within the given example. Accordingly, the combination as made and applied to the specific example above would yield a non-woven polypropylene separator, further rendering obvious the material.)

As to claim 8, Miyasaka teaches of a wound battery, wherein there is a positive electrode [8] negative electrode [0] and a separator [10] separating them (fig.; col. 7, lines 54-65).

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyasaka in view of Shi as applied to claim 1 above, and further in view of US 2002/0037450 (Suzuki et al.).

Miyasaka teaches binder materials for the protective layer. Such binder materials are the same as the ones used for the positive electrode materials, wherein carboxymethyl cellulose (CMC) is specifically appreciated (col. 7, lines 18-25). It is specifically noted more materials (wherein CMC is included) are exemplified in col. 8, lines 33-40). Miyasaka does not specifically teach of a binder having an acrylonitrile group.

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However, Suzuki et al. specifically teach of a binder material used in the positive electrode of a lithium battery (para 0024). Specifically, the binder used is a combination of 2-ethylhexylacrylate, acrylic acid, and acrylonitrile (para 0031). The motivation for using such a binder is in order to have a binder that does not require heating to work and contains no water, in order to have a binder that is flexible but still maintains its form, and in order to provide a binder with the correct amount of stickiness and elasticity in order to prevent binder deterioration as well as to ensure strength (para 0031-0033). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the binder taught by Suzuki et al. (containing acrylonitrile) as the binder in the protective layer of Miyasaka (instead of CMC), in order to provide a binder that would be simple to use (as it does not require heat and does not have extraneous water) and in order to impart a better binder with the right amount of stickiness and elasticity (which ensures that the binder is not deteriorated and ensures proper imparting of strength to the layer). (It is again noted that Miyasaka teaches that the binder used in the protective layer is the same as that used in a positive electrode, and thus such a teaching is combinable.)

Response to Arguments

7. Applicant's arguments filed October 19, 2009 have been fully considered but they are not persuasive.

Applicant continues to the fact that polyethylene (PE) film and non-wovens (such as polypropylene (PP)) are not interchangeable. Now, Applicant (a) points to comparative example 1 (using a non-woven) and comparative example 2 (using a film)

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and states that since the defect ration is higher for comparative example 1, it would not be obvious to interchange the two materials, (b) argues that if shutdown function is evaluated at a lower temperature, comparative Example 2 would have a higher level of safety, and (c) concludes that superior results when using a polypropylene non-woven film is unexpected.

Examiner respectfully disagrees. First it is submitted that this issue (the interchangeability of films and non-wovens) has already been decided by the Board, wherein the Board agreed with Examiner that the substitution of one known material for another was obvious. Arguing the same issue after such a decision is not proper, in light of the fact that no new evidence has been provided. (It is noted that arguing previous presented comparative examples does not constitute new evidence, as all of the data was available at the time of the appeal.) Examiner points to the *Res Judicata* rejection in section 3 and see MPEP § 706.03(w), which supports such a position.

However, Examiner would like to take the time to re-emphasize the position taken.

With respect to (a), just because different separator materials might have different properties does not negate the fact that they are both art recognized separator materials and would both provide the predictable result of functioning as one. Portions of the previous Examiner's Answer, wherein the Board affirmed Examiner's position with respect to interchangeability, are reiterated for clarity's sake:

Yamashita et al. teaches known materials used for separators include olefin polymers, such as polyethylene and non-woven cloth (col. 9, lines 27-38).

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Furthermore, Appellant's own Admitted Prior Art (Background) states that both polyolefin microporous films and non-woven cloths have been used as separators (para 0003-0006). Examiner is unsure how two recognized separator materials are not art recognized equivalents for separator materials and why one of ordinary skill in the art would not have found it obvious to use either as a separator material. Therefore, replacing a microporous film with a non-woven cloth (one separator material for another), accordingly, would have been obvious to one of ordinary skill, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Even if two materials are art recognized equivalents [for separator materials], the materials themselves are different and thus would not behave in exactly the same manner. However, such differences do not negate the fact that they both function as a separator. Therefore, the characteristic for being art recognized equivalents is present; in this case, the necessary characteristic is functioning as a separator (i.e. allowing ion transfer between the electrodes). Just because two different separator materials have different advantages and disadvantages does not undermine the fact that they are both recognized as known separator materials, thus making them art recognized equivalents.

Examiner would also like to note emphasize Appellant's own admitted prior art (Background section) that states that non-woven fabrics retain electrolyte better but have poor mechanical strength, thus resulting in shorter

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cycle life, while microporous films have low porosity and do not retain electrolyte well, which leads to low capacity (para 004; para 0006). This is what was being relied upon to show the fact that one of ordinary skill in the art would have recognized the advantages and disadvantages to two art recognized separator materials: microporous films and non-woven cloths. In addition to Appellant's admitted prior art, Examiner would like to again bring to light that Nakamizo et al. further emphasizes that the portion relied upon in Appellant's admitted prior art was known to one of ordinary skill in the art. Nakamizo et al. shows that it was known that microporous films (polyolefin resins as embodied by both the instant application and that of the prior art of Yamashita et al.) is known to have a low-electrolyte retaining characteristic due to only being able to hold electrolyte in the vacant holes (low porosity) and that non-woven fabrics improve the electrolyte retaining nature (para 0006-0008). Therefore Nakamizo et al. shows that low electrolyte retention (corresponding to a low capacity) was a known problem within microporous films and that high electrolyte retention (corresponding to a high capacity), much like Appellant's own admitted prior art. Additionally, US 6200706 (Ashida et al.) is relied upon as an evidentiary piece to show that it was known to the ordinary artisan that non-woven fabrics are mechanically weak. Example 42 embodies a polyethylene non-woven fabric separator, wherein it is stated that example 42 has low strength and is readily broken (i.e. low mechanical strength), much like Appellant's own admitted prior art (col. 23, lines 62-67; col. 24, lines 1-3; col. 26, lines 58-67). (It is noted that polyethylene is

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used in example 42, while Appellant's exemplified separators are polypropylene. However polyethylene and polypropylene are similar polyolefins and would thus display similar mechanical characteristics (i.e. low mechanical strength) (para 0003 of the instant application (admitted prior art) and col. 8, lines 13-18 of Ashida et al. both support this position.) Again, Examiner would like to make clear that the evidentiary pieces relied upon herein are merely to emphasize that Appellant's admitted prior art would have indeed been known to one of ordinary skill in the art. Accordingly, Examiner submits although differences exist between microporous film separators and non-woven cloth separators, these differences (manifested as the advantages and disadvantages of each material) were known and thus observations based off of such properties are not novel. Accordingly, such comments about knowing the advantages and disadvantages of the different separator material types (PE microporous film and non-woven fabric) do not contradict the fact that different separator material types are art recognized equivalent (as they are both known separator materials).

Furthermore, at this point, a secondary rejection is set forth as well, wherein the primary reference Miyasaka sets forth that both non-wovens and films can be used as separator material. Furthermore, Nakamizo et al. provides motivation as to why one of ordinary skill in the art would have proper motivation to choose the non-woven embodiment. Accordingly, it is unsure, in light of the Board decision and in light of the new rejection why one of ordinary skill in the art would not have found it obvious to use a non-woven separator (instead of a film separator).

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With respect to (b), Examiner submits that Applicant provides no proof or reasoning as to why this would be the case. Accordingly, such a statement is not found to be convincing.

With respect to (c), Examiner respectfully disagrees. It is unsure how unexpected results have been set forth. As set forth in section (a), above, Applicant's own admitted prior art (Background section) that states that non-woven fabrics have poor mechanical strength, wherein Ashida et al. shows that it was known to the ordinary artisan that non-woven fabrics are mechanically weak. Accordingly, it is unsure how the showing of a non-woven (alone) having a higher defective rate (comparative example 1) than a film (comparative example 2). Accordingly, Examiner submits that such a difference in defective rate would actually be expected, as evidenced above.

Furthermore, at this point, a secondary rejection is set forth as well, wherein the primary reference Miyasaka sets forth that both non-wovens and films can be used as separator material. Furthermore, Nakamizo et al. provides motivation as to why one of ordinary skill in the art would have proper motivation to choose the non-woven embodiment.

Again, Examiner would like to emphasize that a secondary rejection is set forth as well, wherein the primary reference Miyasaka sets forth that both non-wovens and films can be used as separator material. Furthermore, Nakamizo et al. provides motivation as to why one of ordinary skill in the art would have proper motivation to choose the non-woven embodiment. Accordingly, it is submitted that it would have been obvious to one of ordinary skill in the art to use a non-woven material.

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Accordingly, Applicant's arguments are not found to be persuasive, and the rejection of record is maintained.

Applicant argues the Board only uses Example 2 to allege that there is no difference between the comparative examples and the disclosure and now that the independent claim has been amended to include a thickness of a porous film to be 0.5-20 μm , that Table 2, that the difference between the temperature of the safety penetration test shows unexpected characteristics (as the remaining examples have a temperature penetration of 86-96°C, which is much different than that of comparative example 4, which is 149°C) of the thickness and the combination.

Examiner respectfully disagrees. Again, it is emphasized that such a claim limitation has been present for Appeal before, accordingly, arguing it after appeal is improper. See the *Res Judicata* rejection in section 3 and see MPEP § 706.03(w).

However, Examiner would like to submit that even with this amendment, unexpected results are still not clear. First Examiner would like to clarify that it appears that the after 90s at a nail speed of 5 mm/s that is being compared (as there are two data points and Applicant fails to clearly point out what is being compared). Second it is stated, that the range Applicant has listed for the temperatures is wrong. Example 9 is higher than 96°C.

Unexpected Results not shown:

With respect to thickness

It is submitted that no clear criticality to the claimed thickness of the porous film is shown. Examples which fall outside the range of the claimed 0.5-20 μm range still

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display a relatively low temperature. For example, Example 8 yields a thickness outside of the range, but still has a penetration temperature of 94°C. Accordingly, it is not clear that the thickness is what provides the difference. Furthermore, there are not enough data points to clearly set forth that this thickness provides unexpected results (i.e. only one point below and above the claimed range). (It is unsure how a thickness 0.5 μm is unexpected over, for example 0.49 μm .)

With respect to the combination (of porous film, now including thickness, and non-woven fabric)

There is no proof that it is the combination of the porous film with the non-woven cloth is what provides the difference. Too many variables are different to make such a clear comparison. For example, the difference may be due to the fact that polyethylene was used for the film (while polypropylene was used for the non-woven fabric). Or, perhaps, the different melt-down temperature applied to the comparative example (as opposed to the examples) provides such a difference. Accordingly, it is submitted that, the combination of the use of a non-woven and a porous film does not clearly set forth unexpected results.

With respect to the rejection using Yamashita et al. as the primary reference

Yamashita et al. teaches a separator [13A, 13B] with a thickness between 100 nm to 100 μm (col. 7, lines 52-55). Specifically, the composite separator thickness of example 6 (relied upon) is 25 μm (col. 31, lines 10-13). Although Yamashita et al. does not mention the thicknesses of each individual section of the separator, 15 μm to 50 μm for the non-woven fabric [13B] (as applied to claim 2) and 0.5 μm to 20 μm [13A] for the

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porous film layer (as applied to claim 1), the combined range of these two sections yields between 15.5 μm to 70 μm . It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to make Yamashita et al.'s separator with the ranges specified by claims 1 and 2, as it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Additionally, claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (*In re Woodruff*, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)).

Furthermore, it is submitted that although the each individual layer of the separator has not been individually set forth, Yamashita et al. at the very least that separator thickness is a result effective variable, wherein if it is too thin, it will be mechanically weak, but if it is too thick, there will not be enough active material for electrochemical reaction (col. 12, lines 22-42). Accordingly, Examiner at least submits that the separator thickness (and accordingly thickness of each layer) is a result effective variable. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the thickness of the separator (and thus each layer of the separator), since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It has been held that discovering that general conditions of a claim are disclosed in the

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prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art *unless* there is evidence indicating such ranges is critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

In such a manner, criticality to the thickness has not been shown. Furthermore, as set forth in the rejection above (and upheld by the Board), no criticality has been shown as to the combination of the porous film with a non-woven separator (since it was found that a film separator and non-woven separator are interchangeable).

With respect to the rejection under Miyasaka

Again, the rejection using Miyasaka as the primary reference is again mentioned. As set forth in the rejection, it specifically teaches an example of the claimed porous film with the specified thickness. It also appreciates the combination of such a film with a non-woven separator. It is unclear how any of the claimed features are novel and unobvious over the teaching of Miyasaka.

Accordingly, the arguments are not found to be persuasive, and the rejections of record are maintained.

Applicant argues that the dependent claims are distinct from the prior art of record for the same reason as the independent claim.

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Examiner respectfully disagrees. The rejection with respect to the independent claim has been maintained, and thus the rejections to the dependent claims are maintained as well.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENIA WANG whose telephone number is (571)272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/E. W./

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/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795